

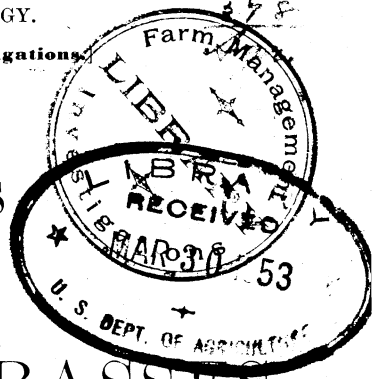
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U. S. DEPARTMENT OF AGRICULTURE.

DIVISION OF AGROSTOLOGY.

[Grass and Forage Plant Investigations.]



STUDIES ON AMERICAN GRASSES.

A SYNOPSIS OF THE GENUS SITANION.

BY

JARED G. SMITH.

PREPARED UNDER THE DIRECTION OF F. LAMSON-SCRIBNER, AGROSTOLOGIST.

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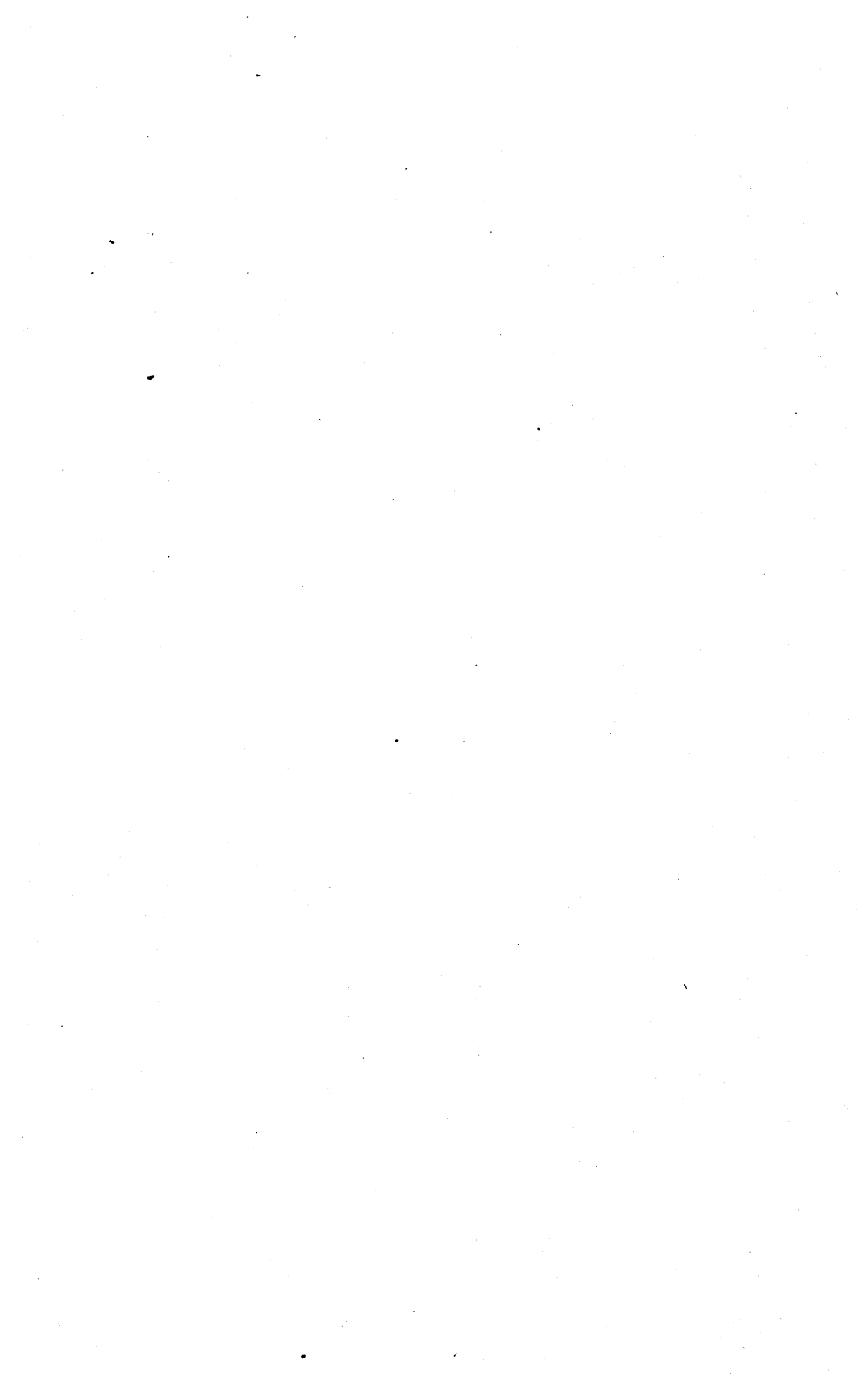
U. S. DEPARTMENT OF AGRICULTURE,
DIVISION OF AGROSTOLOGY,
Washington, D. C., May 3, 1899.

SIR: I have the honor to transmit herewith the manuscript of a paper entitled "Synopsis of the genus *Sitanion*," prepared under my direction by Mr. Jared G. Smith, assistant agrostologist, and recommend the same for publication as Bulletin No. 18 of this division under the general title of "Studies on American Grasses."

Respectfully,

F. LAMSON-SCRIBNER,
Agrostologist.

Hon. JAMES WILSON,
Secretary of Agriculture.



INTRODUCTION.

The many and striking differences presented by the specimens which have been referred to *Sitanion hystrix* (*Elymus sitanion*) have long been recognized, but no one has heretofore attempted to define or classify them. From the material in the herbarium of the Academy of Natural Sciences of Philadelphia, it is evident that Nuttall distinguished at least two species. These are shown in Plate I, the tickets attached to the specimens being in Nuttall's handwriting. The large amount of material in the National Herbarium, gathered from numerous and widely separated localities by many collectors, has afforded an excellent opportunity for a study of the variations which with the increase of the collection became more and more apparent, and the necessity of their classification more and more evident. The present paper, prepared by my direction, was undertaken to meet this necessity, and while the species here defined may require some modification after further studies in the field, and while some classed as species may eventually be reduced to varieties, the subject as presented can hardly fail to be of interest to the student of grasses and helpful in the close discrimination of the species of a critical group of plants.

Nuttall,¹ who first described the species of this genus, referred it to the European *Ægilops* and named his plant *Ægilops hystrix*. His description was carefully drawn up and his species can be readily recognized. A year later, Rafinesque² published his genus *Sitanion*, based upon a single species, which he named *Sitanion elymoides*. It has been found impossible to determine with certainty which of the species enumerated in the present paper was the one named by Rafinesque; it certainly was not, however, the grass described by Nuttall.

Our leading authorities, Bentham and Hooker,³ Hackel,⁴ and Baillon,⁵ have all reduced *Sitanion* to a section of *Elymus*. The articulate rachis, readily breaking up at maturity, and the usually bifid or many parted and awned empty glumes are well-defined characters, distinguishing the species from *Elymus*, and justifying their separation as a distinct

¹ Genera North American Plants, 1: 86. 1818.

² Journ. Phys., 89: 103. 1819.

³ Genera Plantarum 3: p. 1207.

⁴ Die Natürlichen Pflanzenfamilien 2: part 2, p. 88.

⁵ Histoire des Plantes, Monographie des Graminées, 258.

genus. To be sure there are species so closely connecting *Elymus* with *Sitanion* that it is difficult to determine to which genus they ought to be referred, but the same is true in the case of *Elymus* and *Agropyron*; there are intermediates which may with equal propriety be placed either in the one genus or the other.

That there are forms connecting *Sitanion* with *Elymus* indicates their close relationship, but this fact does not afford sufficient reason for uniting them, and the paper here presented, describing the many species into which *Sitanion* may be divided, affords good evidence and ample justification for its separation.

F. LAMSON-SCRIBNER.

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A SYNOPSIS OF THE GENUS SITANION.

CHARACTERS OF THE GENUS.

SITANION Rafinesque, in Journ. Phys., **89**: 103, 1819.

Egilops Nutt., Gen. N. Am. Pl., **1**: 86, 1818; not Linn. (1737.)

Polyantherix Nees, in Ann. Nat. Hist., Ser. I, **1**: 284, 1838.

Cæspitose perennials with intravaginal innovations. Rhachis of the spike articulating at the nodes; spikelets rarely 1, usually 2, or sometimes 3 at each node, each subtended by 2 persistent empty glumes. Empty glumes all subulate, setaceous and entire; or lanceolate and bifid; or many-parted from near the base; with recurving or spreading, scabrous awns terminating each lobe. Flowering glumes all alike, lanceolate, acute, or that of the lowest floret sterile and resembling the subulate-setaceous long-awned empty glumes; entire or with a single terminal recurving or spreading awn, or trifid and 3-awned. Inflorescence a spike, or very rarely spiciform-paniculate. A genus endemic to western North America, containing 23 species.

NOTE: *Sitanion*, section *Elymoides*, consists of 4 species intermediate between this genus and *Elymus*. They are placed here tentatively, as being more closely allied to *Sitanion*.

ANALYTICAL KEY TO THE SPECIES.

* Empty glumes many-lobed; lowest floret sterile, subulate-setaceous.

† Culms robust, 6-9 dm. high, spike and florets large; awn of the flowering glume 8-10 cm. long 1. *S. jubatum*.

†† Culms 1-5 dm. high; spike and florets medium or small; awn of the flowering glume 2-7 cm. long.

‡ Leaves short, flat, divergent; the blades and sheaths villous.

2. *S. villosum*

‡‡ Leaves long, erect or ascending, involute, strigose or pubescent.

= Awns of the empty and flowering glumes about as long as the axis of the spike 3. *S. multisetum*.

= = Awns of the empty and flowering glumes shorter than the axis of the spike.

a Leaves of the innovations involute, filiform, pilose.

4. *S. polyantherix*.

b Leaves of the innovations involute, rather rigid, strigose.

5. *S. breviaristatum*.

** Some of the empty glumes 2-nerved, bifid from about the middle, the lobes abruptly divergent; lowest floret of one or both spikelets sterile and like the empty glumes, but inserted on the rhachilla and falling away with it.

† Only one spikelet at each joint with fertile florets 6. *S. minus*.

†† Both spikelets bearing fertile florets.

‡ Sheaths and dorsal surface of leaves glabrous; glaucous.

a Low alpine plants 7. *S. rigidum*.

b Erect, densely cæspitose 9. *S. glabrum*.

c Erect, slender; flowering glume half as long as its awn.

10. *S. insulare*.

d Slender; innovations very numerous 13. *S. cæspitosum*.

Leaves dorsally pubescent or scabrous.

♂ Awn 2 to 3 times as long as the flowering glume. 11. *S. cinereum*.

♀♀ Awn at least 4 times as long as the flowering glume.

1. Innovations very numerous; culms slender. 12. *S. hystrix*.

2. Innovations few; culms robust.

a Culm leaves 2-8 cm. long; flat, rigid, obtuse, divaricate.

8. *S. californicum*.

b Culm leaves 1-2.5 dm. long, flexuous; flowering glume scabrous.....15. *S. strigosum*.

c Culm leaves short, rigid, ascending, 5-10 cm. long; flowering glume smooth below, scabrous above.

14. *S. montanum*.

d Culm leaves rigid; flowering glume glabrous.

16. *S. molle*.

*** Empty glumes subulate-setaceous, entire; lowest floret hermaphrodite.

a Culm leaves very long, flexuous, filiform-involute..... 18. *S. longifolium*.

b Culm leaves short, rigid, spreading, or horizontally divaricate.

1 Flowering glume 1 cm. long, glaucous; culms robust. 17. *S. brevifolium*.

2 Flowering glume 7 mm. long, soft pubescent; culms low.

19. *S. pubiflorum*.

*** Empty glumes lanceolate, 2-5-nerved, entire or lobed.

† Lowest floret longer than the internodes of the rachis.

‡ Leaves flat, glaucous, more strongly nerved on the back than above, 5-8 mm. wide 20. *S. planifolium*.

‡‡ Leaves involute, more prominently nerved above than on the back, 2-3 mm. wide 21. *S. lanceolatum*.

†† Internodes of the rachis longer than the lowest floret.

1 One spikelet at each node..... 22. *S. hanseni*.

2 Two spikelets at each node..... 23. *S. anomalum*.

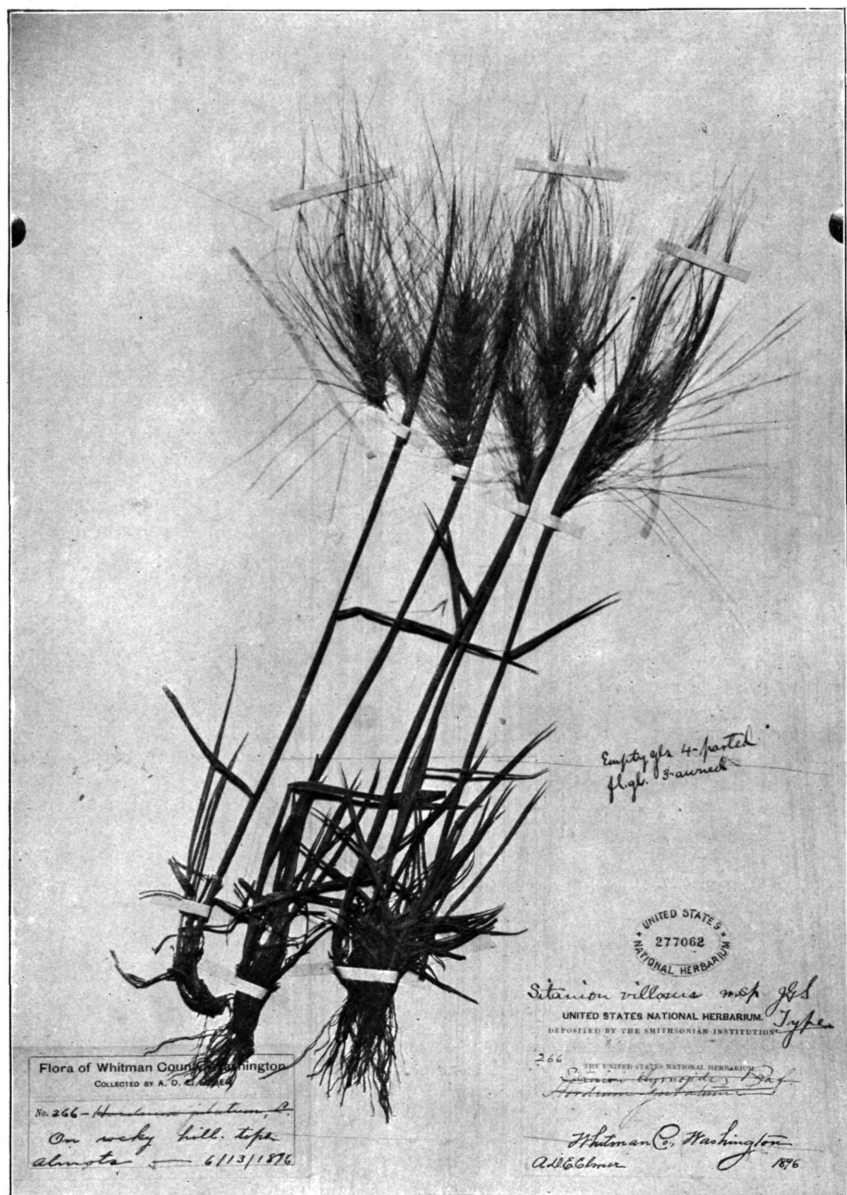
DESCRIPTION OF THE SPECIES.

♂ **Polyantherix.** (Nees, as a genus.) *Lowest flowering glume of one or both spikelets sterile, awnlike; empty glumes deeply cleft into from 3 to 11 or more setaceous awns.*

1. SITANION JUBATUM J. G. Smith, sp. nov.

Culms stout, erect, or ascending, 6 to 9 dm. high, robust, terete, smooth. Nodes glabrous. Lower sheaths hirsute, the upper ones minutely pubescent or when young sparsely hirsute, becoming smooth, much exceeding the internodes, open at the throat. Ligule cartilaginous, 1 mm. long. Blade narrowly linear-lanceolate, 10 to 18 cm. long, 3 to 5 mm. wide, rather rigid, flat at the base, involute toward the acuminate apex, strigose-pubescent throughout, sparsely hirsute above and on the back toward the base, finely nerved above, with the midnerve prominent beneath. Spike 1 to 2 dm. long, often more than 1.5 dm. in diameter to the tips of the spreading awns, densely flowered, exerted or the basal portion inclosed in the uppermost leaf sheath. Empty glumes 4, 3- to many-parted from about the middle, the lobes setaceous, from 1 to 10 cm. long. Spikelets 2 at a node, each 2- to 4-flowered, the lowest sterile, the second hermaphrodite, the uppermost staminate or sterile. Flowering glume linear-lanceolate, acute, 8 to 10 mm. long, smooth and shining below, 5-nerved from about the middle, sparsely scabrous above, trifid at the apex, the lateral lobes setaceous, the middle one prolonged into a slender, scabrous, subflexuous awn, 8 to 12 cm. long. Internodes of the rachis 5 to 7 mm. long, compressed or plano-convex, spatulate, glabrous.

Type collected by Robert M. Horner, No. 573, Waitsburg, Wash., May 27, 1897, distributed as "*Elymus sitanion jubatum*." Also collected by Frank W. Hubby, No. 48, among rocks, Ojai Valley, California, May 7, 1896.



SITANION VILLOSUM J. G. Smith. Type.

This grass is the largest and most robust species of *Sitanion*. It belongs to the *S. multisetum* group, differing from all other species in the very large spike and exceptionally long awn of the flowering glume.

2. **SITANION VILLOSUM** J. G. Smith, sp. nov. Pl. I.

Culms stout, erect, or slightly geniculate, 2 to 3 dm. high, densely leafy at the base, forming close, matted tufts. Sheaths rather densely hirsute, the lower strict, the uppermost somewhat inflated, scabrous. Ligule almost obsolete. Blades short, rigid, ascending or divaricate, finely strigose-pubescent and more or less densely hirsute, scabrous along the cartilaginous margins, linear-lanceolate, acuminate, pungently-pointed, 4 to 8 cm. long, about 3 mm. wide, flat, or at length involute. Spike 6 to 8 cm. long, subflexuous, its base inclosed in the greatly elongated uppermost leaf-sheath. Empty glume 3- to 7- or 8-parted from near the base, each lobe a very slender, scabrous, divaricate awn from 2.5 to 8 cm. long. Lowest floret usually sterile, its glume many-parted, like the empty glumes. Perfect florets 1 or 2. Flowering glume about 8 mm. long, obliquely lanceolate, smooth and shining at the base, scabrous for the upper two-thirds, 3-awned, the middle awn rather stout, divergent, 8 to 10 cm. long, the lateral ones very slender, 5 to 10 mm. long. Palea as long as the flowering glume, obtuse, acute, or with two short, slender awns at the apex. Internodes of the rachis 4 to 5 mm. long, linear-compressed, glabrous.

Type collected by A. D. E. Elmer, No. 266, on rocky hilltops, Almota, Whitman County, Wash., June 13, 1896; also collected by C. V. Piper, No. 2598, on dry, gravelly prairies, Spokane, June 25, 1897; and Robert M. Horner, No. 574, Waitsburg, Wash., June 3, 1897.

This species may be separated from *Sitanion polyantherix*, to which it is closely related, by the short, rigid, hirsute basal culm leaves.

3. **SITANION MULTISETUM** J. G. Smith, sp. nov.

Culms 3 to 5 dm. high, terete, striate, glabrous or minutely strigose-pubescent, erect or slightly geniculate, much branched from the very base. Sheaths rather loose, open at the throat, scarious along the margins above, strigose-pubescent and hirsute on the back, mostly longer than the internodes. Ligule very short, membranaceous. Blades 5 to 10 cm. long, rigid, erect or ascending, linear, acute and pungently pointed, flat, becoming involute, sparsely hirsute on the back, scabrous on the margins, hirsute and scabrous along the prominent nerves above. Spike erect, 5 to 8 cm. long. Spikelets two at each node but usually only one bearing perfect florets. Empty glumes many-parted nearly to the base, the slender, ascending, scabrous awns varying from 1 to 5 or rarely 8 cm. long. Lowest flowering glume of the sterile spikelet subulate, resembling the segments of the empty glumes, but somewhat lanceolate at the base. Flowering glume of the fertile spikelet about 8 or 9 mm. long, linear-lanceolate, rounded on the back, smooth and shining below, keeled and scabrous above, 3-awned, the middle awn stout, rigid, scabrous, 5 to 6 cm. long, the lateral ones slender, 3 to 8 mm. long. Palea as long as the flowering glume, acute or bicuspidate. Internodes of the rachis compressed, spatulate above, smooth and shining, scabrous along the margins, 4 to 5 mm. long.

Type specimen collected by Coville and Funston, No. 1121, Tehachapi Valley, Kern County, Cal., June 25, 1891. Other specimens which may be referred to this are Samuels, No. 225, Sonoma County, Cal.; a specimen collected by Bolander at San Francisco without date or number; Dr. Palmer, No. 2422, Petaluma, 1892; Hansen, No. 617, Clinton, Amador County, June 30, 1893; a specimen marked "J. A. Allen, California;" and L. Schoenefeldt, No. 3439, Nachoguero Valley, Lower California, June 14, 1894.

It differs from *Sitanion polyantherix* and *S. breviaristatum* in the very much longer and more rigid, erect or ascending awns of the empty glumes, and the leaves hirsute dorsally toward the base and along the nerves above.

4. **SITANION POLYANTHERIX** J. G. Smith, new name. *Polyantherix hystrix* Nees, in Ann. Nat. Hist. 1: 284 (1838), not *Egilops hystrix* Nutt.

Culms 3 to 4 dm. high, terete, striate, minutely strigose-pubescent. Sheaths striate, scabrous, closely enveloping the internodes and longer than them, hirsute. Ligule very short, membranaceous. Blades 6 to 25 cm. long, linear, long-attenuate or filiform, involute, acuminate, the lower hirsute on the back, the upper smooth, scabrous and sparsely hirsute on the nerves above. Spike 7 to 10 cm. long, rather rigid and densely flowered. Spikelets 2 at each node; all the florets of one of the spikelets sterile and the lowest and uppermost florets of the other either staminate or sterile, only the second producing seed. Empty glumes 5- to many-parted from near the base, the segments extending into slender, abruptly divaricate awns, 6 to 25 mm. long. Flowering glume of the hermaphrodite floret linear-lanceolate, acute, smooth and shining for its lower two-thirds, slightly scabrous above, with a rigid, scabrous awn 2.5 to 3 cm. long arising from between two minute teeth. Palea a little longer than the flowering glume, acute. Internodes of the rachis very short, smooth and shining, compressed, broadest above, about 3 mm. long.

Type collected by Douglas, in California. There is a specimen in the National Herbarium, labeled *Sitanion polyantherix*, which was collected by Dr. J. M. Bigelow, surgeon and botanist to Lieut. A. W. Whipple's expedition for a railway route from the Mississippi River to the Pacific Ocean, near the thirty-fifth parallel of latitude in 1853-54, California, without locality, and it is from this plant that the above description is drawn.

This species may be separated from *S. breviaristatum*, to which it is related, by the very long-attenuate, filiform leaves, and taller and more slender culms.

5. **SITANION BREVIARISTATUM** J. G. Smith, sp. nov.

Low, caespitose perennial, with slender, erect spikes and very long, rigid, erect or ascending leaves. Culms about 2 dm. high, erect, clothed with dead leaf-sheaths at the base. Sheaths smooth, closely enveloping and longer than the internodes, scarious along the margins. Ligule nearly obsolete. Blades 5 to 15 cm. long, linear, rigid, pungently pointed, densely strigose-pubescent on both surfaces, closely involute. Spike slender, rigid, 3 to 6 cm. long. Empty glumes 2- to many-parted, bearing scabrous, flexuous, divergent awns, from 7 to 20 mm. long. Flowering glume about 6 mm. long, narrowly lanceolate, smooth below, scabrous above, tipped with a short, rigid awn from 1 to 1.5 cm. long. Palea as long as the flowering glume, acute, 2-nerved, scarious along the margins, bicuspidate. Grain adherent to the palea, elliptical, oblanceolate, 5 mm. long, compressed, acute at the base, rounded at the apex. Internodes of the rachis compressed, 4 to 5 mm. long, spatulate above, glaucous.

Type specimen collected by Coville and Funston, No. 833, Willow Creek Canyon, Panamint Mountains, California, May 22, 1891.

This species differs from *Sitanion multisetum* to which it is related, in the low, densely caespitose habit; short, slender spikes; and very short awns of the empty and flowering glumes. The bases of the culms are clothed with papery leaf-sheaths.

§§ **Eusitanion.** *Lowest floret of one or both spikelets sterile and like the empty glumes; some of the empty glumes bifid from about the middle, the divisions divergent; the others entire, subulate-setaceous.*

6. **SITANION MINUS** J. G. Smith, sp. nov.

Culms 1.5 to 2 dm. high, slender, rigid, erect, terete, glabrous. Nodes glabrous. Culm leaves 5. Sheaths glabrous, closely enveloping and longer than the internodes. Ligule almost obsolete. Blades 5 to 7 cm., those of the innovations 8 to 12 cm. long, rigid, erect or somewhat divaricate, linear, acuminate, involute, smooth and glabrous on the back, scabrous on the margins, strigose-pubescent on the nerves above. Spikes 3 to 5 cm. long, slender, their bases included in the

upper leaf sheaths, closely-flowered. Empty glumes 4, subulate or one of the lateral ones often lanceolate and 2-nerved, bifid from above the middle, scabrous, 25 to 32 mm. long. Spikelets 2-flowered, both florets of one of them sterile, reduced to subulate awns. Lower floret of the other hermaphrodite, the flowering glume 5 mm. long, lanceolate, strongly nerved and scabrous above the middle, smooth below, entire, tipped by a slender scabrous, subflexuous awn about 3 cm. long. Palea as long as the flowering glume, bicuspidate. Second floret rudimentary, awned. Internodes of the rachis 2 to 3 mm. long, spatulate, glabrous.

Type collected by L. Schoenefeldt, No. 3277, International Boundary Commission, Jacumba Hot Springs, near monument 233, altitude 900 m., May 24, 1894.

Related to *Sitanion multisetum*.

7. *SITANION RIGIDUM* J. G. Smith, sp. nov.

Culms 1 to 2 dm. high, terete, striate. Nodes glabrous. Sheaths longer than the internodes, smooth and glaucous, or the lower ones hirsute, open at the throat. Ligule cartilaginous, 1 mm. long. Blades 3 to 8 cm. long, 2 to 3 mm. wide, rigid, involute, smooth and glaucous on the back, obtuse or acute at the apex, scabrous along the margins and nerves above. Spike 2 to 8 cm. long, ascending, exerted its own length, or the base included in the uppermost leaf-sheath; empty glumes 4 and entire, or 6 (*i. e.*, the two lateral ones at each node divided to the very base) awned, strongly divaricate, 2 to 3 cm. long. Lowest floret sometimes sterile, like the empty glumes. Spikelets few-flowered. Flowering glume 7 to 9 mm. long, linear-lanceolate, trifid, smooth and glaucous below, scabrous above, tipped with a stout, divergent awn 3 to 4 mm. long. Internodes of the rachis 3 to 4 mm. long, compressed, scabrous on the margins.

Type collected by O. D. Allen, No. 178, Cascade Mountains, Washington, 1896. Other specimens examined are Elmer, No. 1145, Washington, 1898; and G. R. Vasey, Washington, 1889; H. E. Brown, No. 372, north side of Mount Shasta, California, 1897; R. M. Horner, No. 579, Blue Mountains, Washington, July 29, 1897; A. Nelson, No. 1021, Union Pass, Wyoming, August 13, 1895; J. N. Rose, No. 271, Timber Reserve, northwest Wyoming, August 28, 1893; Frank Tweedy, No. 79, Teton Forest Reserve, Wyoming, July, 1897; and S. Watson, No. 1337, E. Humboldt Mountains, Nevada, August, 1868.

This grass is related to *S. glabrum*, differing in the dwarf habit of growth and rigid glaucous leaves.

8. *SITANION CALIFORNICUM* J. G. Smith, sp. nov.

Culms low, ascending, 1.5 to 2.5 dm. high, terete, striate, densely pubescent above, geniculate at the nodes. Sheaths longer than the internodes, the lower ones densely hirsute, the upper minutely puberulent, the uppermost many times longer than the blade. Ligule obsolete. Blade 2 to 8 cm. long, 3 to 4 mm. wide, rigid, divaricate or ascending, prominently striate, linear-lanceolate, abruptly contracted at the base, attenuate toward the obtuse or subacute apex, scabrous above and on the margins, densely puberulent on the back. Spike subflexuous, erect or ascending, loosely few-flowered, 5 to 8 cm. long, barely exerted or the base inclosed in the uppermost leaf-sheaths. Lowest floret of one of each pair of spikelets sterile. Empty glumes 4, entire, subulate-setaceous, divaricate, 3 to 5 cm. long. Flowering glume linear, acute, abruptly rounded at the base, 10 to 12 mm. long, finely scabrous, terminating in a stout, divaricate, scabrous awn about 4 cm. long, arising from between two minute lateral setae. Palea 2 mm. shorter than the flowering glume, truncate or obtuse, scabrous on the nerves above. Internodes of the rachis compressed, 4 to 5 mm. long, scabrous throughout.

Type collected by S. B. Parish, No. 3295, San Bernardino Mountains, California, altitude 2,150 m., June 23, 1894. Closely related to *S. rigidum*, but with leaves pubescent throughout and longer flowering glumes.

9. **SITANION GLABRUM** J. G. Smith, sp. nov.

Culms erect, terete, smooth and shining, glaucous. Sheaths glaucous, glabrous, rather closely enveloping and shorter than the internodes, scarious along the margins, open at the throat. Ligule membranaceous, almost obsolete. Blades 7 to 15 cm. long, 2 to 5 mm. wide, broadly linear, acute, flat becoming involute, smooth and glabrous on the back, scabrous-pubescent along the nerves above. Spike 5 to 8 cm. long, slender, subflexuous, its base inclosed in the swollen uppermost sheath. Empty glumes bifid from the very base, the lobes subulate, setaceous, 6 to 8 cm. long, subflexuous, slender, divaricate. Flowering glume 7 to 8 mm. long, rounded on the back, smooth and shining for its lower two-thirds, linear-lanceolate, acute, entire or minutely bifid at the apex, tipped with a slender, rigid, setaceous awn 4 to 5 cm. long. Palea as long as the flowering glume, bidentate, scabrous on the nerves above. Internodes of the rachis obconiculate, compressed, about 3 mm. long.

Type collected by Coville and Funston, No. 914, near Crystal Spring, Coso Mountains, California, June 12, 1891. Also collected by J. A. Allen, California, without date or locality. No. 821, Hall, San Jacinto Mountains, may be placed here; and also Purpus, No. 5289, Pah Mountains, 1897. The latter has the habit of typical *S. glabrum*, but the leaves and sheaths are minutely soft pubescent and the spikelets and empty glumes purplish. Other specimens examined are: L. Schoenefeldt, No. 3609, Laguna, Cal., June 14, 1894; and C. V. Piper, No. 1952, dry slopes Mount Rainier, Wash. 2,100 m., August, 1895.

10. **SITANION INSULARE** J. G. Smith, sp. nov.

Culms slender, erect, terete, glabrous. Nodes glabrous. Culm leaves 4 or 5. Sheaths glabrous, closely enveloping the culm, open at the throat, shorter than the internodes. Ligule almost obsolete. Blades linear, 1 to 1.5 dm. long, glabrous on the back, strongly nerved and strigose-pubescent on the nerves above, scabrous along the margins. Spike slender, 5 to 8 cm. long. Empty glumes lanceolate, bifid and 2-awned, 4 to 5 mm. long, 2 mm. wide, tipped with divergent, slender, scabrous awns, 10 to 20 mm. long. Flowering glume 8 mm. long, linear-lanceolate, smooth and shining, glabrous for the lower two-thirds, rounded on the back below, keeled above, 3-toothed, the middle nerve extending into a stout, scabrous, divaricate awn about 15 mm. long; lateral teeth 1 to 2 mm. long. Palea as long as the flowering glume, 2-toothed at the apex. Internodes of the rachis linear, dilated above, sharply 2-edged, scabrous on the margins, 7 to 10 mm. long.

Type collected by Sereno Watson, No. 1338, Carrington Island, Salt Lake, Utah, June, 1869.

This species is quite distinct from any other in the National Herbarium. It has the broad empty glumes of *Elymus*, but two-parted, as in *Eusitanion*, with divaricate awns. The empty glumes are inserted as in *Sitanion*, while the form of the spikelets and the habitat of the inflorescence resembles some species of *Agropyron*. As in the other *Sitanion* species the rachis breaks up into segments at maturity.

11. **SITANION CINEREUM** J. G. Smith, sp. nov.

Slender, ascending, leafy perennial, 2 to 3 dm. high, the entire plant ashy-gray with a close, dense pubescence. Innovations as long as the culms. Culms slender, terete, pubescent. Nodes glabrous. Sheaths closely enveloping the internodes and shorter than them, densely ciliate-pubescent. Ligule almost obsolete. Blades linear, rigid, involute, the uppermost 5 to 7, the lower 15 to 20 cm. long, densely strigose-pubescent on the nerves above, soft-pubescent or hirsute below. Spike slender, 4 to 5 cm. long. Empty glumes very scabrous, bifid, 2-awned, the strongly divergent scabrous awns 2 to 3 cm. long. Flowering glumes 7 to 8 mm. long, rounded on the back, scabrous throughout, 3-nerved toward the apex, 3-awned, the lateral awns very slender, 2 to 4 mm. long, the middle one stout,



SITANION HYSTRIX (Nutt.) J. G. Smith.

Photograph of Nuttall's type in the Herbarium of the Philadelphia Academy of Science.

divaricate, 2 to 3 cm. long. Palea as long as the flowering glume, tipped with two slender scabrous awns. Internodes of the rachis scabrous along the margins; 2 to 4 mm. long.

Type collected by S. M. Tracy, No. 222, Reno, Nev., 1887.

It differs from any other specimen in the National Herbarium in being densely grayish-pubescent throughout. In the character of the spikelets it approaches *S. hystrix*. No. 127, Suksdorf, Bickleton, Yakima County, Wash., June 7, 1884, with similar leaves and inflorescences, but the plant less densely pubescent and quite glaucous, may be placed here. Also a specimen collected by Dr. C. H. Merriam on Mount Shasta, California, 1898.

12. **SITANION HYSTRIX** (Nutt.) J. G. Smith, new combination. (*Egilops hystrix* Nutt. Gen. N. Am. Pl., 1: 86, 1818.) Pl. II.

Culms 1 to 3 dm. high, slender, erect or ascending, scabrous above, clothed at the base with papery leaf-sheaths. Innovations very leafy, one third to two-thirds the length of the culms. Sheaths striate, strigose-pubescent, open at the throat, closely enveloping the internodes. Ligule almost obsolete. Blades narrowly linear, flat or at length involute, strigose-pubescent throughout, prominently 9-nerved, scabrous along the margins, erect or ascending; those of the innovations 7 to 12 cm. long, 1 to 2 mm. wide; culm leaves about as long, 2 to 4 mm. wide. Spike 5 to 7 cm. long, erect or subflexuous, exerted, or its basal portion inclosed in the uppermost leaf-sheath, closely flowered. Spikelets 3- to 4-flowered, compressed. Empty glumes bifid, from near the base and unequally 2-awned; the strongly scabrous, glaucous, divergent awns, 3 to 4 cm. long. Flowering glume 7 to 8 mm. long, linear-lanceolate, minutely pubescent, 3-awned, the middle awn rather slender, recurved, about 3 cm. long. Palea as long as or longer than the flowering glume, scabrous, tipped with two slender awns, 2 to 3 mm. long. Internodes of the rachis glaucous, linear, not at all dilated above, about 5 mm. long.

A common, worthless bunch grass on shale hills and among the sagebrush on the high plains from western Colorado to eastern Washington.

SPECIMENS EXAMINED: *Wyoming:* P. A. Rydberg, No. 2028, Wamsutter, July 24, 1895; C. L. Shear, No. 280 $\frac{1}{2}$, Wamsutter, June 24, 1895; No. 283, Green River, June 25, 1895; Thomas A. Williams, No. 2437, dry rocky hillsides, Evanston, July 10, 1897; No. 2379, dry sagebrush hills, Green River, July 9, 1897; Aven Nelson, No. 3058, Green River Hills, May 31, 1897; No. 3669, Wamsutter, July 10, 1897; No. 3784, North Vermilion Creek, July 20, 1897.

Washington: C. V. Piper, No. 2579, on sagebrush land, Ellensburg, July 9, 1897. A. B. Leckenby, Walla Walla, July 12, 1898.

Colorado: John Wolfe, No. 623, 1873; C. Thomas, 1869; and F. E. Clements, No. 60, Wal-senburg, July 10, 1896.

There are in the herbarium of the Philadelphia Academy of Science two of Nuttall's specimens of *Sitanion*. One of these, labeled "*Chretomeris trichoides*, R. Mts. Platte," is exactly identical with No. 3784, A. Nelson, and No. 283, C. L. Shear, both collected in the Red Desert of Wyoming. The other, labeled "*Elymus difformis*, R. Mts. Platte," is nearly identical with No. 2028, Rydberg, from Wamsutter, Wyo. If these specimens are those from which Nuttall's description of *Egilops hystrix* was drawn, and they agree better with his description than any specimen from the "arid plains of the Missouri" so far examined, then there was undoubtedly a mistake made in referring the habitat of this to that locality.

I am assured by Dr. E. L. Greene that it is highly improbable that Rafinesque drew his description of *S. elymoides* from Nuttall's plant, and it is certain that Rafinesque's description (Journ. Phys. 89: 1819) differs in important particulars from that of *Egilops hystrix*, Nuttall. I am, however, unable definitely to identify any *Sitanion* with which I am familiar as the true *S. elymoides*, Raf. The locality, "Missouri," of 1819, was then applied to what now constitutes several large

States in which a dozen or more separate species occur. Rafinesque apparently left no type, and the original description is too fragmentary to enable one to more than guess at the identity of the plant which he described.

13. SITANION CÆSPITOSUM J. G. Smith, sp. nov.

Densely caespitose, with flat leaves, and weak, ascending culms. Sterile shoots very leafy, erect or spreading, 1 to 2 dm. long. Culms 2 to 3 dm. high, very slender, terete, glabrous. Nodes glabrous. Sheaths striate, open at the throat, smooth and glabrous. Ligule membranaceous, entire, very short. Blades 4 to 10 cm. long, 2 to 3 mm. wide, linear, flat, or the margins incurved, prominently 7-nerved above, glabrous on the back, scabrous above. Spike 4 to 6 cm. long, its base sometimes inclosed in the uppermost sheath, mostly exserted, somewhat flexuous. Empty glumes entire or bifid, 3 to 4 cm. long, divaricate, scabrous. Flowering glume of the lowest fertile floret linear-lanceolate, entire, smooth and shining below, sparsely scabrous above the middle, about 7 mm. long, tipped with a flexuous scabrous awn, about 5 mm. long. Callus rounded, glabrous. Palea as long as the flowering glume, rounded at the apex. Joints of the rachis glabrous, except along the margins, not at all dilated above, two-thirds the length of the lowest floret.

Growing in rich soil in the canyons around Silver City, N. Mex.

Type specimens collected by Jared G. Smith, near Cliff, N. Mex., August 19, 1897.

Also collected at the same locality in August, 1896. It grows only in shaded canyons, and on moist talus slopes in the mountains at an altitude of about 2,000 m. Its leaves continue green during the winter. It is one of the "mutton grasses," formerly abundant and highly valued as forage for sheep and cattle, now to be found only in protected situations. Probably also occurring in the mountains of western Texas, although there are no specimens from any other locality than the typical one in the National Herbarium.

Closely related to *S. hystrix* (Nutt.) JGS., but the sheaths and blades are glabrous on the back.

14. SITANION MONTANUM J. G. Smith, sp. nov.

Culms rather stout, erect, 2 to 4 dm. high, terete, striate, glabrous below, scabrous above. Sheaths rather loose, open at the throat, as long as, or longer than, the internodes, smooth, scabrous or pubescent. Blades 5 to 10 cm. long, 3 to 4 mm. wide, linear, acuminate, flat or involute, pubescent on the back, scabrous or strigose-pubescent on the prominent nerves above, scabrous along the margins, rigid, erect or ascending, the uppermost usually shorter than the spike. Spike erect, loosely flowered, 5 to 10 cm. long. Empty glumes subulate, scabrous, long-awned, some of those in the lower part of the spike unequally bifid, the lobes extending into scabrous, divergent awns 5 to 6 cm. long, 2 or often 3 spikelets at each node. Lowest floret sterile. Flowering glumes 10 to 11 mm. long, linear-lanceolate, rounded on the back, smooth and shining for the lower third, scabrous above and on the margins, trifid, three-awned, the scabrous, divergent middle awn 4 to 7 cm. long, the lateral awns very short, slender. Palea as long as the flowering glume, with two short, setaceous, scabrous awns, or sometimes rather obtuse and muticous. Internodes of the rachis linear or dilated above, compressed, glaucous, 4 to 6 mm. long.

S. montanum differs from *S. strigosum* in the shorter, flat, and more rigid erect leaves and smoother flowering glume. This may be Rafinesque's *S. elymoides*.

Northern Wyoming and Montana to Oregon. SPECIMENS EXAMINED: *Montana*: F. Lamson-Scribner, No. 437, gravelly bottoms, Indian Creek, July 4, 1883; rather densely cinereous-pubescent throughout. P. A. Rydberg, No. 3091 (type), Spanish Creek, July 15, 1896; and No. 3133, Spanish Basin, July 18, 1896. Thomas A. Williams, No. 2002, Spanish Creek Basin, July 16, 1896, on sterile, rocky soil.

Wyoming: Thomas A. Williams, No. 2776, Bull Camp, August 2, 1897; and No. 2596, Ten Sleep Lakes, Big Horn Mountains, August 19, 1897.



SITANON BREVIFOLIUM J. G. Smith. Typical.

Idaho: B. W. Everman, No. 319, shores of Petit Lake, August 13, 1895.

Oregon: A fragmentary specimen collected by the U. S. South Pacific Exploring Expedition, under the command of Captain Wilkes, 1838-1842, is doubtfully referred here.

15. **SITANION STRIGOSUM** J. G. Smith, sp. nov.

Culms stout, erect, 3 to 6 dm. high, terete, striate, glabrous, the uppermost internodes minutely pubescent. Nodes brownish, glabrous. Sheaths open at the throat, loose, striate, scarious along the margins above, more or less densely pubescent, as long as or longer than the internodes. Ligule nearly obsolete. Blades 1 to 2.3 dm. long, 3 to 6 mm. wide, linear to linear-lanceolate, flat or the lower ones involute, rounded at the base, long-acuminate pointed, strongly nerved, strigose-pubescent throughout, sparsely hirsute along the nerves, scarious on the cartilaginous margins. Spike stout, erect, exserted, 8 to 12 cm. long. Empty glumes with the awn 5 to 6 cm. long, entire or bifid, scarious, long-awned, divaricate. Flowering glumes 8 to 10 mm. long, lanceolate, rounded on the back, scarious and glaucous, strongly 3-nerved above, the middle awn stout, recurved, scarious, 5 to 7 cm. long, the lateral ones 1 to 2 mm. long. Palea nearly as long as the flowering glume; bifid, with two short awns, ciliate along the nerves above.

Type collected by P. A. Rydberg, No. 3298, Sheep Creek, Montana, August 8, 1896. Also collected by Charles A. Geyer, June 10, 1839, "in heavy ferruginous loam, Missouri, James and Shienne River valleys," probably at the eastern border of the Bad Lands, above Mandan, N. Dak.

S. strigosum differs from *S. montanum* in the very long, less rigid, more strongly nerved culm leaves, the uppermost nearly as long as or much exceeding the spike, those of the innovations half the length of the culm. The flowering glumes are more scarious and shorter. This may be Rafinesque's *S. elymoides*.

16. **SITANION MOLLE** J. G. Smith, sp. nov.

Culms stout, erect, rigid, 3 to 4 dm. high, clothed at the base with dead leaf-sheaths, terete, striate, pubescent. Innovations about half as long as the culm. Nodes glabrous. Sheaths rather loose, open at the throat, longer than the internodes, pubescent, the lower ones sparsely hirsute along the nerves, the upper puberulent and scarious on the nerves. Ligule entire, almost obsolete. Blades rigid, erect or ascending, linear, long-acuminate pointed, 8 to 15 cm. long, 3 to 5 mm. wide, the uppermost longer than the spike, soft-pubescent throughout, scarious along the cartilaginous margins, on the nerves above and along the mid-rib beneath. Spike 7 to 8 cm. long, erect, loosely flowered, shortly exserted. Empty glumes 4, entire or unequally bifid, subulate-setaceous, 6 to 7.5 cm. long, scarious, divaricate. Lowest floret of one of the spikelets sterile and like the empty glumes. Flowering glume of the lowest hermaphrodite floret linear-lanceolate, acute, 1 cm. long, smooth and shining, glaucous, trifid, or entire, tipped with a stout, spreading, scarious awn 5 to 7 cm. long. Palea as long as the flowering glume, acute, or bicuspidate scarious along the nerves.

Type collected by Shear and Bessey, No. 1469, East Side Buffalo Pass, Larimer County, Colo., moist, open mountain side, 3,200 m. August 14, 1898.

S. molle is related to *S. montanum*. It differs in being finely pubescent throughout. The leaves are longer and less strongly nerved.

§§§ *Hordeiformae*. Lowest floret hermaphrodite. Empty glumes 4, entire.

17. **SITANION BREVIFOLIUM** J. G. Smith, sp. nov. Pl. III.

Culms 3 to 6 dm. high, terete, stout, erect, obscurely striate, glaucous. Innovations less than half the length of the culms. Nodes glabrous. Sheaths smooth, scarious along the margins, glaucous, longer than the internodes, the uppermost much elongated, the lower sometimes pubescent or hirsute. Ligule almost

obsolete. Blades 5 to 10 or rarely 12 cm. long, 3 to 4 mm. wide, linear, acuminate, flat or involute, rigid, divergent or ascending, smooth and glaucous on the back, scabrous-pubescent along the prominent nerves above. Spike 7 to 15 cm. long, loosely few-flowered, long-exserted. Empty glumes stout, setaceous, divergent, 5 to 9 cm. long, smooth and shining and often glaucous at the base, scabrous above. Flowering glumes 8 to 10 mm. long, linear-lanceolate, glaucous, scabrous throughout, rounded on the back below, nerved above, entire, tipped with a stout, scabrous, spreading awn 4 to 8 cm. long. Palea as long as the flowering glume, scabrous on the margins above, obtuse. Joints of the rachis compressed, glaucous, 5 to 10 mm. long, linear. Closely related to *S. longifolium*, but the culm leaves shorter and more rigid and the innovations less than half as long as the culms.

Type collected by J. W. Toumey, No. 797, Tucson, Ariz., 1892.

SPECIMENS EXAMINED, Colorado: Tracy, Earle & Baker, No. 4274, Hamors Lake, July 24, 1898; No. 429, Mancas, August 29, 1898; No. 4272, Durango, July 18, 1898. C. L. Shear, No. 1087, Breckenridge, August 29, 1896; No. 1070, Dillon, August 26, 1896; No. 612, Georgetown, August 17, 1896; No. 997, Westcliffe, August 12, 1896; No. 912, Marshall Pass, July 27, 1896; No. 1003, Buena Vista, August 15, 1896; No. 814 and 833, Veta Pass, July 13, 1896; No. 1096, Como, September 1, 1896; No. 1240, Animas Canyon, August 5, 1897. P. A. Rydberg, No. 2414, Georgetown, August 20, 1895; No. 2509, Boulder, September 3, 1895. Shear & Bessey, No. 1407, Egeria Park, August 4, 1898. Patterson, Georgetown, 1875.

Wyoming: Thomas A. Williams, No. 2573a, Iron Mountain, July 2, 1897, and No. 2621, Bear Lodge, July 23, 1897; A. Nelson, No. 3952, Albany County, August 9, 1897.

Utah: Marcus E. Jones, No. 5663bd, Marvine Lacleolite, July 23, 1894; No. 5684bb, Mount Ellen, Henry Mountains, July 25, 1894, and 5770p, Fish Lake, August 7, 1894.

18. *SITANION LONGIFOLIUM* J. G. Smith, sp. nov.

Culms 3 to 5 dm. high, stout, ascending, somewhat geniculate at the base, glaucous. Leaves of the innovations 1.5 to 3 dm. long, attenuate, involute, often as long as the culms. Nodes glabrous. Sheaths scabrous and glaucous, or more or less strigose-pubescent, or sparsely hirsute, longer than the internodes, loose, open at the throat, scarious along the margins above. Ligule entire, almost obsolete. Blades linear, long, attenuate, acuminate, striate, smooth and glaucous or pubescent, or sparsely hirsute on the back, 1 to 2 dm. long, 1 to 3 or 4 mm. wide. Spike subflexuous or somewhat nodding, 1 to 1.3 dm. long, rather loosely flowered, its base inclosed in the inflated uppermost leaf-sheath. Spikelets 2 or rarely 3 at each node. Empty glumes subulate setaceous, divaricate, scabrous, 6 to 8 cm. long. Flowering glumes 8 to 11 mm. long, scabrous, glaucous, rounded on the back below, keeled above, entire or minutely trifid, tipped with a stout, scabrous divaricate awn 5 to 6.5 cm. long. Palea as long as the flowering glume, obtuse or bicuspidate, scabrous on the nerves above. Internodes of the rachis compressed, glaucous, 6 to 8 mm. long. Closely related to *S. brevifolium*, from which it may be distinguished by the long attenuate flexuous leaves of the culms and innovations and by the subflexuous spikes, inclosed at the base in the uppermost leaf-sheaths.

Type collected by C. L. Shear, No. 1213, near Silverton, Colo., August 4, 1897, among rocks on the open sides of a canyon, altitude 3,000 m.

SPECIMENS EXAMINED, Colorado: J. Wolfe, No. 1161-2-3, Denver, 1873. C. L. Shear, No. 1152 and No. 1158, Ouray, July 4, 1897; No. 886, Villa Grove, July 24, 1897; No. 836, Veta Pass, July 15, 1896; No. 717, Idaho Springs, August 27, 1895. M. E. Jones, No. 531, Idaho Springs, August 1, 1878. Tracy, Earle & Baker, No. 4275, Chicken Creek, July 6, 1898. P. A. Rydberg, No. 2497, Idaho Springs, August 28, 1895.

Kansas: C. H. Thompson, No. 21, Ulysses, June 26, 1893.

Wyoming: D. Griffiths, Nos. 493 and 500, Sundance, August 10, 1897; No. 576, Little Missouri Buttes, August 15, 1897; No. 669, Inyankara Mountain, August 23, 1897; A. Nelson, No. 1602, Laramie Peak, August 6, 1895.

Nevada: Shockley, without date or locality.

Arizona: Dr. Palmer, No. 534, 1876. G. C. Nealley, No. 171, Rincon Mountains, August, 1891.

New Mexico: C. Wright, No. 2076, in part, 1851-52. E. O. Wooten, No. 322, White Mountains, August 12, 1897.

Texas: J. Reverchon, Upper Concho River (Curtiss, No. 3536).

19. SITANION PUBIFLORUM J. G. Smith, sp. nov.

Low, caespitose perennial, with stout, rigid, erect culms, 2 to 3 dm. high, and tufted, erect, rigid innovations, 1 to 1.5 dm. long. Culms terete, strigose-pubescent above. Culm leaves 3 to 5. Nodes glabrous, glaucous. Sheaths about as long as, or longer than, the internodes, open at the throat, not at all inflated, glabrous. Ligule obsolete. Blades puberulent on the back, rigid, linear-involute, pungently-pointed, scabrous above, the lowest 10 cm., the uppermost 1.5 to 4 cm. long and horizontally spreading or divaricate. Spike exerted, erect, about 5 cm. long. Empty glumes setaceous, divaricate, 4 to 6 cm. long, scabrous throughout, not at all lobed or divided. Spikelets $2\frac{1}{2}$ -flowered, the uppermost floret rudimentary. Flowering glume of the lowest floret 7 mm. long, linear-lanceolate, acute, with a rounded callus, scabrous and finely pubescent, tipped with a straight, erect, scabrous awn, 5 to 6 cm. long. Palea rounded or entire at the apex, as long as the flowering glume, scabrous along the margins. Joints of the rachis one-half to two-thirds as long as the lowest floret, dilated above, scabrous.

Arizona, New Mexico, and southeastern Colorado: Type No. 795, J. W. Toumey, Tucson, Ariz., 1892. Other specimens of this are No. 38, Toumey, south of Ashfork, Ariz., June 25, 1892; C. R. Orcutt, No. 2533, Congress, Ariz., April 21, 1896. A specimen from the Moqui country without data. A. A. & E. G. Heller, No. 3558, Santa Fe, N. Mex., May 21, 1897. C. S. Crandall, No. 535, Trinidad, Colo., May 13, 1892.

This species is distinguished from *S. brevifolium* by the rigid, convolute, erect, puberulent leaves, densely tufted at the base of the low culms, erect spikes, and smaller pubescent flowering glumes.

§§§**Elymoides.** Empty glumes lanceolate, 2-5-nerved, entire or lobed, lowest floret hermaphrodite; spikelets 1 or 2 at a node, when 1, the empty glumes inclosing the spikelet as in *Elymus* and *Agropyron*; rachis of the spike articulate at the nodes.

20. SITANION PLANIFOLIUM J. G. Smith, sp. nov.

Culms stout, erect, 5 to 6 dm. high, the lower internodes smooth and shining, glaucous, terete, the uppermost slightly striate, glabrous. Sheaths striate, glaucous, open at the throat, loose. Ligule obsolete. Blades 8 to 15 cm. long, 5 to 8 mm. wide, flat, lanceolate, becoming involute toward the acuminate apex, scabrous above, and along the cartilaginous margins, glabrous on the back, more strongly nerved below than above. Spike erect or somewhat nodding, 6 to 9 cm. long, purplish, long-exserted. Spikelets subcylindrical, compressed. Empty glumes 6 to 7 mm. long, lanceolate, strongly 1- to 3-nerved, entire or bifid, glaucous at the base, strongly scabrous on the nerves above, tipped with a slender, spreading, scabrous awn, about 2 cm. long. Flowering glume 10 to 11 mm. long, lanceolate, flat or rounded on the back, glaucous, sparsely and minutely scabrous, bearing a stout, scabrous awn 3 to 4 cm. long. Palea as long as, or slightly longer than, the flowering glume, glaucous, scabrous, obtuse at the apex. Joints of the rachis linear, compressed, dilated above, glaucous, 5 mm. long, very sharply 2-edged, scabrous on the margins.

Type collected by W. N. Saksdorf, No. 224, high mountains, Skamania County, Wash., August 10, 1896.

Closely related to *S. lanceolatum*, from which it differs in the glaucous sheaths and culms, flat, lanceolate leaves which are very smooth on the back, and the purplish, long-exserted spikes with glaucous florets.

21. **SITANION LANCEOLATUM** J. G. Smith, sp. nov.

Culms 2.5 to 5 dm. high, erect or ascending, and somewhat geniculate at the lower nodes. Culms terete, smooth and ascending, striate above. Nodes glabrous. Sheaths glabrous, striate, closely enveloping the culms, longer than the internodes. Ligule almost obsolete. Blades 8 to 15 cm. long, 2 to 3 mm. wide, rather rigid, linear, erect, or the basal ones divergent, flat or convolute, glabrous on the back, scabrous on the margins and nerves above. Spike erect, 6 to 10 cm. long, barely exerted, or its base included in the uppermost leaf-sheath. Spikelets cylindrical, subcompressed, the florets closely overlapping one another. Empty glumes 5 to 6 mm. long, keeled, lanceolate, 2-nerved, oblique, scarious on the margins, entire or unequally 2-awned, the longer awn scabrous, divergent, 10 to 15 mm. long. Flowering glume 8 to 9 mm. long, glaucous, rounded on the back, lanceolate, entire, or minutely 3-toothed at the apex, with a stout, scabrous, divergent awn 2 to 4 cm. long. Palea as long as its glume, obtuse or emarginate, scabrous on the margins above. Joints of the rachis, 5 to 7 mm. long, linear, spatulate, compressed, scabrous on the margins.

Type collected by P. A. Rydberg, No. 3381, Barker, Mont., August 17, 1896.

The habit of this grass resembles that of *Agropyron caninoides* Beal; the spikelets and empty glumes are arranged as in *Elymus*, but the nervation of the empty glumes, trifid flowering glume, and the rachis dehiscent at the nodes, are sufficient characters to throw this species into *Sitanion*.

22. **SITANION HANSENI** (Scribn.) J. G. Smith, nom. nov. *Elymus hansenii* Scribn. U. S. Dept. Agr., Div. Agros., Bull. 11: p. 56. 1898.

"A rather stout, glabrous perennial, 9 to 12 dm. high, with narrow, spreading leaves and slender fragile spikes 5 to 8 cm. long. Sheaths smooth, striate. Ligule very short, hardly 1 mm. in length, entire. Leaf-blades 10 to 30 cm. long, 2 to 5 mm. wide. Internodes of the rachis about 1 cm. long. Spikelets 3- to 5-flowered, about 1.5 cm. long, exclusive of the awns. Empty glumes lanceolate, strongly nerved, tipped with 2, sometimes 3, unequal awns, the longer about 3.5 cm. First flowering glume 10 to 12 mm. long, entire or 2-toothed at the apex, terminating in a straight or very slender awn about 5 cm. long. Palea about the length of the glume, minutely scabrous on the sharp keels except at the base, slightly pubescent at the truncate or 2-toothed apex."

Amador County, Cal.

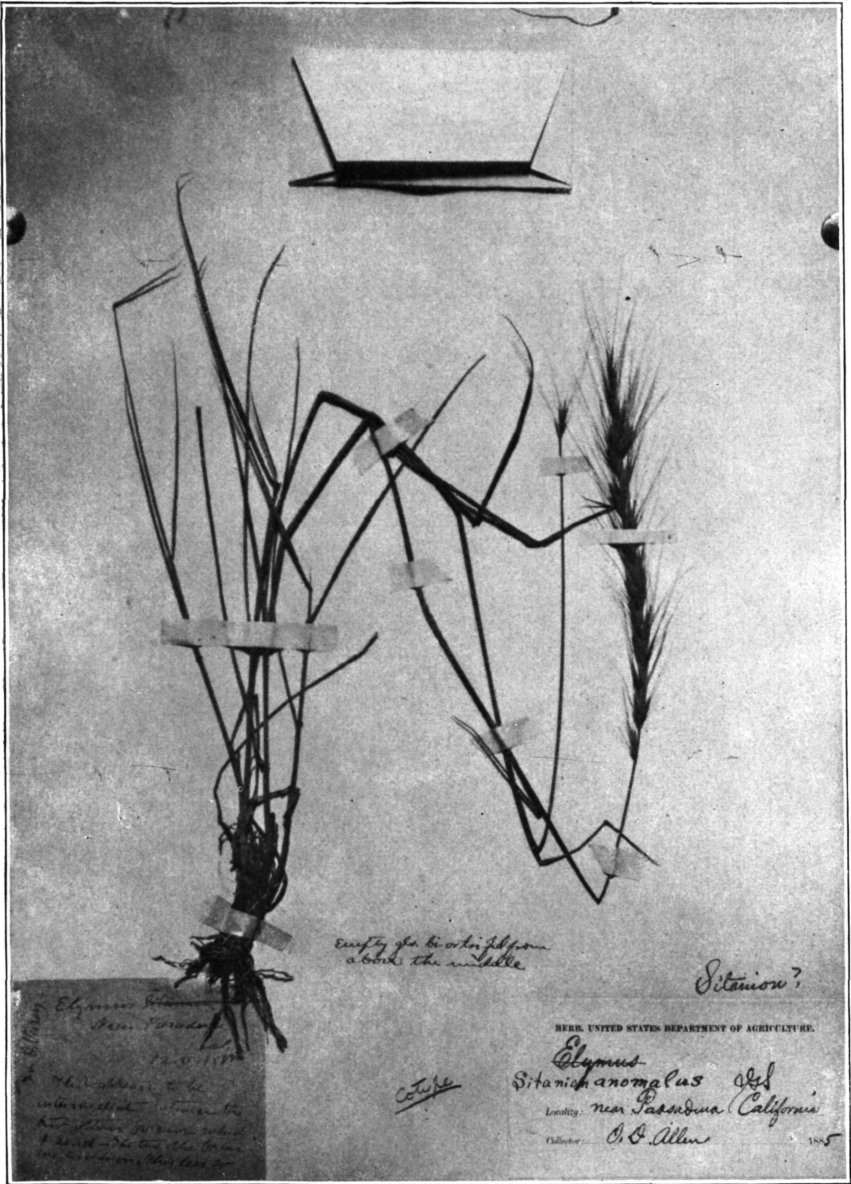
Related to *S. anomalum*, but taller and more slender, with mostly single rather remote spikelets, which are longer.

23. **SITANION ANOMALUM** J. G. Smith, sp. nov. (Pl. IV).

Culms erect or ascending, 5 to 6 dm. high, terete, smooth. Nodes glabrous. Sheaths smooth or the lower sparsely hirsute, ciliate along the margins, shorter than the internodes. Ligule membranous, 1 mm. long. Blades 4 to 12 cm. long, 3 to 4 mm. wide, involute, rigid, linear, long-attenuate, scabrous throughout. Inflorescence simple or thyrsiform, 1 to 1.5 dm. long, few-flowered, interrupted below, subflexuous. Spikelets compressed, 4-flowered, the florets distant. Empty glumes mostly lanceolate, entire, but those of the lowermost spikelets bifid above the middle, with short, scabrous, divergent awns 1 to 4 cm. long. Flowering glumes 1 cm. long, narrowly linear-lanceolate, rounded on the back, smooth below, scabrous above the middle, 3-aristate, lateral awns 1 to 2 mm. long, the middle one straight, erect, scabrous, 3 to 4.5 cm. long. Palea shorter than the flowering glume, obtuse, erose, or bidentate, scabrous along the margins and on the nerves. Internodes of the rachis 7 to 10 mm. long, ancipital, scabrous on the margins.

Type collected by O. D. Allen, near Pasadena, Cal., May 12, 1885. This grass is intermediate between true *Sitanion* and true *Elymus*. The habit is that of *Elymus*, but the articulate rachis, occasionally bifid empty glumes and trifid flowering glumes, indicate a close relationship with *Sitanion*.

DOUBTFUL SPECIES. *Sitanion elymoides* Raf.



SITANION ANOMALUM J. G. Smith. Cotype.

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